CLAIMS

1. A transmitting apparatus comprising:

a bit adding part that adds predetermined bits to bits of main data according to quality of an environment of a communication path to produce hybrid bit data; and

a modulating part that performs modulation on the basis of the hybrid bit data produced to produce a modulated wave signal and transmits the modulated wave signal,

wherein the bit adding part operates to decide quality of an environment of a communication path, add, when it is decided that the environment of the communication path is defective, redundant bits to respective bits of main data to produce the hybrid bit data, and add, when it is decided that the environment of the communication path is non-defective, respective bits of associated data associated with the main data to the respective bits of the main data instead of the redundant bits to produce the hybrid bit data.

2. The transmitting apparatus according to claim 1, wherein the bit adding part operates to arrange symbols of the hybrid bit data such that a Euclidian distance of the hybrid bit data added with the redundant bits is extended.

3. The transmitting apparatus according to claim 1, wherein the bit adding part operates to add the redundant bits to the respective bits of the main data

such that a gray code is produced.

4. The transmitting apparatus according to any one of claims 1 to 3, further comprising a received signal strength indicator measuring part that measures a received signal strength indicator of a data transmission destination, wherein the bit adding part operates to acquire the received signal strength indicator from the received signal strength indicator measuring part and decide quality of an environment of the communication path on the basis of a level of the received signal strength indicator acquired.

5. The transmitting apparatus according to any one of claims 1 to 3, wherein the bit adding part operates to acquire at least one piece of information among the received signal strength indicator measured by a data transmission destination, a vector error of a demodulated wave, and a bit error and decide quality of an environment of the communication path on the basis of the information acquired.

6. The transmitting apparatus according to any one of claims 1 to 3, wherein the modulating part performs modulation in accordance with a multi-value FSK system.

7. A receiving apparatus that receives a signal produced on the basis of hybrid bit data obtained by adding predetermined bits to respective bits of main

data, the apparatus comprising:

a demodulating part that demodulates the signal received;

a symbol deciding part that applies, at every Nyquist interval, symbol decision to the signal demodulated by the demodulating part to produce a symbol value;

a bit converting part that converts the symbol value produced by the symbol deciding part into a bit value; and

a data recoverying part that combines respective bits of the main data to recovery original main data from the bit value converted by the bit converting part, combines bit data added to the respective bits of the main data to form combined data, decides validity of the combined data formed, recoverys data decided as valid as additional data, deletes the added bits when it is decided that the combined data is invalid, and combines the bit data from which the added bits are deleted to recovery original data.

8. The receiving apparatus according to claim 7, wherein the data recoverying part operates to decides validity of the combined data formed by combining the added bit data in accordance with a cyclic redundancy check.

9. A data transmitting method characterized by comprising:

a step of deciding quality of an environment of a

communication path;

a step of adding, when it is decided that the environment of the communication path is defective, redundant bits to respective bits of main data to produce data, and adding, when it is decided that the environment of the communication path is non-defective, respective bits of associated data associated with the main data to the respective bits of the main data instead of the redundant bits to produce hybrid bit data; and

a step of producing a modulated wave signal on the basis of the hybrid bit data produced to transmit the modulated wave signal.

10. A data receiving method of receiving a signal produced on the basis of hybrid bit data obtained by adding predetermined bits to respective bits of main data, the method comprising the steps of:

demodulating the signal received;

applying, at every Nyquist interval, symbol decision to the signal demodulated to produce the symbol value;

converting the symbol value obtained by performing the symbol decision into a bit value;

combining respective bit data of the main data to recovery original main data from the bit value obtained by the bit converting step; and

combining bits added to the respective bits of the main data to form combined data from data of the bit value obtained by the bit converting step to form

combined data, deciding validity of the combined data formed, recoverying data decided as valid as additional data, deleting the added bits when it is decided that the combined data is invalid, and combining the bit data from which the added bits are deleted to recovery original data.

11. A computer program that causes a computer to execute the processing steps of:

deciding quality of an environment of a communication path;

adding, when it is decided that the environment of the communication path is defective, redundant bits to respective bits of main data to produce data, and adding, when it is decided that the environment of the communication path is non-defective, respective bits of associated data associated with the main data to the respective bits of the main data instead of the redundant bits to produce the hybrid bit data; and

producing a modulated wave signal on the basis of the data produced to transmit the modulated wave signal.

12. A computer program for causing a computer to execute the processing steps of:

demodulating a signal received;

applying, at every Nyquist interval, symbol decision to the signal demodulated to produce a symbol value;

converting the symbol value produced by the symbol decision into a bit value;

combining respective bit data of the main data to recovery original main data from data of the bit value converted; and

combining bits added to the respective bits of the main data to form combined data from data of the bit value converted, deciding validity of the combined data formed, recoverying data decided as valid as additional data, deleting the added bits when it is decided that the combined data is invalid, and combining the bit data from which the added bits are deleted to recovery original data.